

EXHIBIT 1

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

LG. PHILIPS LCD CO., LTD.,)	
)	
Plaintiff,)	C.A. No. 05-292 (JJF)
)	
v.)	
)	
TATUNG COMPANY,)	
TATUNG COMPANY OF AMERICA, INC.,)	
CHUNGHWA PICTURE TUBES, LTD.,)	
AND VIEWSONIC CORPORATION,)	
)	
Defendants.)	

DEFENDANTS FIRST SET OF DOCUMENT REQUESTS (NOS. 1-64)

Defendants, Chunghwa Picture Tubes, Ltd., Tatung Company, Tatung Company of America Inc., and Viewsonic Corporation (collectively referred to herein as "Defendants") request that Plaintiff produce the documents and things described in the following requests which are within its possession, custody, or control. Defendants will examine the documents at the offices of its counsel, or where the documents are maintained by Plaintiff, or at any other mutually agreeable location where suitable examination and photocopying facilities exist or can be arranged. By accepting photocopies, Defendants are not waiving its right to examine originals where necessary.

Where Plaintiff withholds documents for reasons of attorney-client privilege, work-product immunity or the like, Defendants request that it be served with a list of such documents prepared in accordance with applicable case law, including at least the names and titles or functions of the authors; any recipients; the date; the basis for withholding; and a description of the document and its subject matter sufficient to allow Defendants to contest the claim. Defendants will accept confidential documents under a suitable protective order.

patent, its foreign counterparts and any related family patent rights, and instructions to U.S. and foreign patent counsel and patent agents.

REQUEST NO. 7:

All documents referring or relating to the ownership of the patents-in-suit, each foreign counterparts, or related family patent rights, including but not limited to assignment documents and all documents referring or relating to the acquisition of the patents-in-suit, each foreign counterpart, or related family patent rights.

REQUEST NO. 8:

All documents referring or relating to the licensing of the patents-in-suit, each foreign counterparts, or related family patent rights, or any products, processes, or methods sold thereunder, including but not limited to documents sufficient to identify each past or present licensee; documents, periodic reports or summaries sufficient to reflect all royalties and other payments made by such licensees; forecasts, projections, and estimates of future royalty payments; and all documents referring or relating to any licensing agreements, plans or programs to license or not to license, licensing negotiations, or offers or attempts to license the patents-in-suit.

REQUEST NO. 9:

All documents and things relating to LPL's contentions as to the scope and content of the prior art, the level of skill in the art, and the differences between the art and the claims of the patents-in-suit.

REQUEST NO. 10:

All documents relating to the first use, first public use, first offer to sell, first sale, first offer to license, first license, first printed publication containing a description, first written

description, first advertisement, and other manner of first disclosure to a third party of any article or process embodying any of the alleged inventions claimed by the patents-in-suit, its foreign counterparts, or related family patent rights.

REQUEST NO. 11:

All documents relating to each discussion with, disclosure to, or other manner of providing to a third party, or sale of or offer to sell, any invention claimed in the patents-in-suit, its foreign counterparts, or related family patent rights prior to the date of said patent application; including but not limited to contracts, purchase orders, invoices, advertisements, marketing materials, offer letters, beta site testing agreements, and third party or joint development agreements.

REQUEST NO. 12:

All documents relating to the design and development of any invention claimed in the patents-in-suit, its foreign counterparts, or related family patent rights, which were created on or before the date of said patent application or the priority date relied on for said patent application.

REQUEST NO. 13:

All engineering notebooks, laboratory notebooks, records, disclosures, logs, and files relating to any of the inventions claimed in the patents-in-suit, its foreign counterparts, or related family patent rights, which were generated or maintained by or at the direction of any of the inventors to each patent, its foreign counterparts, or related family patent rights; or into which any of these inventors made any entries.

REQUEST NO. 14:

All documents and things relating to, referring to, supporting, or discussing the conception, first written description (including in executable or compilable code), reduction to

practice, and diligence in the reduction to practice of any of the inventions claimed in the asserted claims of the patents-in-suit.

REQUEST NO. 15:

All documents and things relating, referring or describing any tests, experiments, reports, data or other evaluations conducted by LPL or others regarding determining the brightness difference generated between an area where the Tape Carrier Package ("TCP") is adhered onto the LCD panel and an area where the TCP is not adhered onto the LCD panel, including but not limited to the tests disclosed in Table 1 of the '121 patent.

REQUEST NO. 16:

All documents and things relating, referring, or describing any tests, experiments, reports, data or other evaluations conducted by LPL or others regarding reducing a thermal expansion force and thermal contraction force generated when thermal-pressing the output pad onto the LCD panel.

REQUEST NO. 17:

All documents relating to secondary indications of nonobviousness of any of the invention(s) claimed in the patents-in-suit, including but not limited to commercial success of Plaintiff's Products and/or the invention(s), long felt but unsolved needs met by those products embodying the invention(s), failure of others to meet those needs, the scope of licensing of the patents, professional approval of Plaintiff's Products and/or the invention, and deliberate copying of the invention(s) or laudatory statements by accused infringers.

REQUEST NO. 18:

All published or unpublished articles, papers, manuscripts, technical reports, conference papers, or other publications authored, co-authored, written or co-written by LPL and/or any of

the inventors to the patents-in-suit, its foreign counterparts, or related family patent rights; relating to or discussing the subject matter described and/or claimed in each patent, its foreign counterparts, or related family patent rights.

REQUEST NO. 19:

All documents (including but not limited to contracts, purchase orders, invoices, advertisements, marketing materials, offer letters, beta site testing agreements, and third party or joint development agreements) relating to any discussion with, disclosure to, or other manner of providing to a third party, or sale or offer for sale prior to July 12, 1988 of any product embodying the '002 patent-in-suit, whether or not an actual product existed at the time of such offer for sale.

REQUEST NO. 20:

All documents (including but not limited to contracts, purchase orders, invoices, advertisements, marketing materials, offer letters, beta site testing agreements, and third party or joint development agreements) relating to any discussion with, disclosure to, or other manner of providing a third party, or sale or offer for sale prior to March 23, 2001 of any product embodying the '121 patent-in-suit, whether or not an actual product existed at the time of such offer for sale.

REQUEST NO. 21:

Documents sufficient to show the current residence and place of employment of each named inventor of the patents-in-suit.

REQUEST NO. 22:

All documents relating to any inventor of the patents-in-suit, including but not limited to any documents related to correspondence with inventors, employment files, or notebooks.

REQUEST NO. 60:

All communications between William K. Bohannon and Plaintiff, including any attorney acting on behalf of Plaintiff, that relates to the subject matter of William K. Bohannon's declaration filed in support of Plaintiff's Motion for Preliminary Injunction.

REQUEST NO. 61:

All drafts of the declarations of William K. Bohannon, which was filed in support of Plaintiff's Motion for Preliminary Injunction.

REQUEST NO. 62:

All documents reviewed and/or relied on by William K. Bohannon for any purpose related to his declaration that was filed in support of Plaintiff's Motion for Preliminary Injunction.

REQUEST NO. 63:

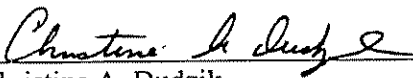
All documents that confirm, refute, or relate to any opinion expressed by William K. Bohannon in his declaration filed in support of Plaintiff's Motion for Preliminary Injunction.

REQUEST NO. 64:

All documents and things referred to, relied upon, confirm or refute Plaintiff's answers to Defendant's First Set of Interrogatories 1-20 served herewith.

Respectfully submitted,

Dated: December 14, 2005


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CERTIFICATE OF SERVICE

The undersigned counsel certifies that on December 16, 2005 copies of the foregoing document were served via email and U.S. first class mail to the following:

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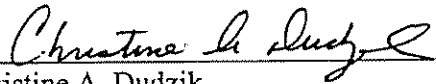

Christine A. Dudzik

EXHIBIT 2

WIPS PIVIEW 3.3.3.1

(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

(51) Int. Cl. G02F 1/133	(11) 공개번호 (43) 공개일자	특2001-0065166 2001년07월11일
(21) 출원번호	10-1999-0065035	
(22) 출원일자	1999년12월29일	
(71) 출원인	엘지.필립스 엘시디 주식회사, 구본준, 론 위라하디락사 대한민국 150-875 서울 영등포구 여의도동 20번지	
(72) 발명자	정기룡 대한민국 730-330 경상북도구미시황상동210황상주공아파트113동506호	
(74) 대리인	정원기	
(77) 심사청구	없음	
(54) 출원명	캐리어 테이프를 가진 액정표시장치	

요약

본 발명은 액정패널과; 상기 액정패널 배면에 장착된 배광장치와;

상기 배광장치의 배면에 장착되어 상기 액정패널에 신호를 인가하는 인쇄회로기판과; 상기 액정패널과 상기 인쇄회로기판을 연결하고, 상기 배광장치의 상부모서리에 제 1 벤딩슬릿과; 상기 배광장치의 하부모서리에 제 2 벤딩슬릿과; 상기 제 1 벤딩슬릿과 상기 액정패널 사이에 적어도 하나의 슬릿을 가진 캐리어테이프를 포함하는 액정표시장치를 개시하고 있다. 또한, 상기 캐리어테이프는 상기 제 2 벤딩슬릿과 상기 외부회로 사이에 적어도 하나의 슬릿을 가진다.

따라서, 액정패널과 제 1 벤딩슬릿 사이 및/또는 PCB와 제 2 벤딩슬릿 사이에 위치한 슬릿으로 인하여, 상기 두 부분에서 발생하는 수축응력을 저감시켜 그 부분의 셀갭의 변화가 최소화되고, 휘도차가 감소함으로써, 급격적으로 균일한 화상이, 얻어지며, 탭본딩(tap bonding)의 불량을 방지하여 액정표시장치의 품질을 향상시킬 수 있다.

대표도

도8

명세서

도면의 간단한 설명

도 1은 종래의 액정표시장치의 액정패널을 도시한 단면도이다.

도 2는 액정패널과 구동회로가 내장된 TCP를 TAB 방식으로 연결한 구조를 도시한 사시도이다.

도 3은 도 2의 단면도이다.

도 4는 종래의 TCP를 나타내는 도면이다.

도 5는 TCP를 액정패널에 접착하는 방법을 나타내는 도면이다.

WIPS PIVew 3.3.3.1

도 6은 종래의 액정표시장치의 문제점을 나타내는 도면이다.

도 7은 본 발명의 실시예에 따른 TCP를 나타내는 도면이다.

도 8은 본 발명의 실시예에 따른 TCP가 액정패널 및 PCB에 연결된 구조를 나타내는 단면도이다.

<도면의 주요 부분에 대한 부호의 설명>

•20 : 액정패널 •50 : TCP

•51 : 구동회로 •52 : PCB

•70 : 제 1 벤딩슬릿 •72 : 제 2 벤딩슬릿

•74 : 슬릿

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 액정표시장치에 관한 것으로 보다 상세하게는 TAB(Tape Automated Bonding) 방식을 사용하여 구동IC (drive integrated circuit)를 실장한 액정표시장치에 관한 것이다.

액정 표시장치의 구동원리는 액정의 광학적 이방성과 분극성질을 이용한다. 상기 액정은 구조가 가늘고 길기 때문에 분자의 배열에 방향성을 갖고 있으며, 인위적으로 액정에 전기장을 인가하여 분자배열의 방향을 제어할 수 있다.

따라서, 상기 액정의 분자배열 방향을 임의로 조절하면, 액정의 분자배열이 변하게 되고, 광학적 이방성에 의하여 상기 액정의 분자 배열 방향으로 빛이 굴절하여 화상정보를 표현할 수 있다.

현재에는 전술한 바 있는 박막 트랜지스터와 상기 박막 트랜지스터에 연결된 화소전극이 행렬 방식으로 배열된 능동행렬 액정 표시장치(Active Matrix LCD : AM-LCD)가 해상도 및 동영상 구현능력이 우수하여 가장 주목받고 있다.

일반적으로 액정 표시장치를 구성하는 기본적인 부품인 액정 패널의 구조를 살펴보면 다음과 같다.

도 1은 일반적인 액정 패널의 단면을 도시한 단면도이다.

액정패널(20)에는 여러 종류의 소자들이 형성된 두 장의 기판(2, 4)이 서로 대응되게 형성되고, 상기 두 장의 기판(2, 4) 사이에 액정층(10)이 개재된 형태로 위치하고 있다.

상기 액정패널(20)은 색상을 표현하는 컬러필터가 형성된 상부 기판(4)과 상기 액정층(10)의 분자 배열방향을 변환시킬 수 있는 스위칭 회로가 내장된 하부기판(2)으로 구성된다.

상기 상부기판(4)에는 색을 구현하는 컬러필터층(8)과, 상기 컬러필터층(8)을 덮는 공통전극(12)이 형성되어 있다. 상기 공통전극(12)은 액정(10)에 전압을 인가하는 한쪽 전극의 역할을 한다. 상기 하부기판(2)은 스위칭 역할을 하는 박막트랜지스터(S)와, 상기 박막 트랜지스터(S)로부터 신호를 인가 받고 상기 액정(10)으로 전압을 인가하는 다른 한쪽의 전극역할을 하는 화소전극(14)으로 구성된다.

상기 화소전극(14)이 형성된 부분을 화소부(P)라고 한다.

그리고, 상기 상부 기판(4)과 하부 기판(2)의 사이에 주입되는 액정(10)의 누설을 방지하기 위해, 상기 상부 기판(4)과 하부 기판(2)의 가장자리에는 실런트(sealant : 6)로 봉인되어 있다.

상기 박막 트랜지스터(S)는 외부의 구동회로(Integrated Circuit ; IC)에서 신호를 인가 받아 상기 화소전극(14)을 구동하게 된다.

상기 박막 트랜지스터(S)는 게이트 전극, 소스전극, 드레인 전극의 세 전극으로 이루어지며, 상기 게이트 전극은 게이트 배선과 접촉된다. 또한, 상기 소스 전극은 데이터 배선과 접촉되며, 상기 게이트 및 데이터 배선의 끝단에는 각각 게이트 패드와 데이터 패드가 형성되며, 상기 게이트 및 데이터 패드와 외부의 구동회로와 연결된다.

상기 외부 구동회로는 크게 두 종류로 나눌 수 있으며, 상기 게이트 패드와 연결되어 상기 게이트 전극을 제어하는 게이트 구동회로와 상기 데이터 패드와 연결되어 상기 소스 전극을 제어하는 데이터 구동회로가 그것이다.

상기와 같이 액정 표시장치의 구동을 위한 구동회로(driver IC)를 액정패널(LCD panel)과 연결시키는 기술에는 COB (chip on board), TAB (tape automated bonding), COG (chip on glass)방식 등이 있다.

종래의 세그먼트(segment) 방식의 액정 표시장치 또는 낮은 해상도의 패널의 경우에는 리드라인(lead line)의 수가 적기 때문에 구동회로가 PCB(printed circuit board)위에 있고, 보드(board)의 리드를 패널과 HSC(heat seal connector)로 연결하는 것이 용이했다.

그러나, 액정패널이 고 해상도화 됨에 따라 엄청난 수의 리드를 갖는 구동회로를 보드에 장착하기가 용이하지 않게 되었다. 즉, 예를 들면 600×800의 해상도를 갖는 SVGA급의 액정패널의 경우, 천연색을 표현하기 위해서는 600×800×3의 화소를 갖게 되는데, 각각의 화소를 모두 구동회로에 연결해야만 한다.

또한, 와이어본딩 방식은 접속단자 하나 하나를 접속해 가는 이른바 순차식 접속방법으로써, 액스레이 디테터와 같이 접속단자의 접속수가 매우 많은 경우는 시간이 많이 걸리고 접속단자 사이의 거리가 좁으면 연결이 불가능하다. 또한, 와이어 루프의 높이로 인해 접속 면적이 늘어나는 문제점이 있다.

상기와 같은 문제점을 해결한 방식이 TAB(tape automated bonding)방식인 것이다. 즉, 상기 TAB 방식은 구동회로를 테이프 캐리어(tape carrier)위에 장착함으로써, 상기의 문제를 해결한 것이다. 상기 테이프 캐리어에 구동회로가 내장된 것을 테이프 캐리어 패키지(tape carrier package : TCP)라 칭한다.

도 2는 액정패널(20)과 구동회로(51)가 내장된 TCP(50)를 TAB 방식으로 연결한 구조를 도시한 도면이다.

즉, 상기 TCP(50)에는 구동회로(51)가 내장되어 있고, 상기 액정패널(20)은 상기 TCP(50)를 통해 상기 구동회로(51)와 연결된다. 그리고, 프런트 회로기판(52)(이하, PCB라 한다.)도 상기 TCP(50)와 연결된다.

상기한 TCP 방식의 일반적인 조립 공정을 크게 나누면 인너리드본딩(ILB : Inner Lead Bonding)공정, 캡슐화(Encapsulation)공정, 아우트리드본딩(OLB : Outer Lead Bonding) 공정으로 나눌 수 있는데, 인너리드본딩 공정은 릴투릴(Reel to Reel) 방식으로 이동되는 테이프캐리어와 기판 상의 칩을 위치 정렬하여 열에너지와 압력을 이용하여 접속한다. 캡슐화(Encapsulation) 공정은 인너리드본딩 공정후 칩에 에폭시계 수지를 피막하여 주위환경으로부터 칩과 인너리드(Inner Lead)를 보호해 주는 역할을 하는 공정이며 아우트리드본딩 공정은 캡슐화 공정후에 전기적 테스트를 마친 다음에 아우트리드(Outer Lead)를 인쇄회로기판(PCB : Printed Circuit Board) 상에 형성된 패드에 연결하는 공정이다.

해상도가 증가할수록 패드의 정밀도가 높아져 패드 전극의 피치가 점점 좋아지기 때문에 접속공정 조건이 갈수록 어려워지고 있다. 또, 이러한 방법에 의한 집적회로 실장방식은 최근 다 핀화, 박형, 소형, 경량화의 요망에 따라 급격히 용도가 넓어지고 있으며 집적회로 칩을 일괄 본딩하는 방식으로 접속공정이 단순화되어 리퍼어가 용이하고 접속불량을 감소시킬 수 있다.

상술한 TAB 방식의 액정패널의 실장방법은 현재 가장 일반적인 방식으로 널리 실용화 되어있다.

한편, PCB(52)는 미도시된 배광장치의 이면에 위치하고 있는 바, 이를 도 3의 개략단면도를 참조하여 자세히 설명한다.

도 3에 도시한 바와 같이, 패널(20)의 하부에는 미도시된 광원을 가진 배광장치(30)가 위치하고 있고, 배광장치(30)의 이면에는 PCB(52)가 위치하고 있다. 액정패널(20)의 패드부(21)와 PCB(52)는 TCP(50)로 연결되어 있는 바, TCP(50)에는 구동회로(51)가 장착되어 있다.

WIPS PIVIEW 3.3.3.1

TCP(50)의 구조는 우선 솔더레지스트(solder resist)가 하부에 위치한다고 할 때, 솔더레지스트 상에 다수의 리드라인이 배설되어 있고, 리드라인 상에는 점착제를 통하여 베이스필름(base film)이 배설되어 있다. 또한, 도 4에 도시한 바와 같이, TCP(50)에는 제 1 밴딩슬릿(bending slit; 70)과 제 2 밴딩슬릿(72)이 배설되어 있는데, 이는 단순히 배광장치(30)를 감싸고 액정패널(20)의 하부에 위치한 PCB(52)과 연결되는 데 필요한 가연성(flexibility)을 제공하기 위함이다. 또한, 이 슬릿부분의 리드라인상에는 폴리이미드가 코팅처리되어 있다.

상술한 TCP(50)와 하부가판은 다음과 같은 방식에 의하여 일반적으로 부착된다. 도 5에 도시한 바와 같이, 이방성도전필름인 ACF(anisotropic conductive film; 60)를 우선 TCP(50)가 부착되는 위치에 배설한 후, TCP(50)를 ACF(60)와 열라민하여 약간의 힘으로 가압착한다. 그 후, 고온상태에서 본압착을 실행하여 점착을 완료한다.

이때, 고휘도 액정표시장치의 경우, 하부가판에 부착되는 TCP(50)의 패드부와 제 1 밴딩슬릿(70) 사이 부분 'A'의 가연성은 매우 적게 되어 있어, 점착시, 도 5에 도시한 바와 같이, TCP(50) 애지부에는 상온으로 복귀하면서 수축응력이 발생하고, 따라서 인접한 두 개의 TCP(50) 사이 부분에 대응하는 패드부분의 셀갭(cell gap)은 국부적으로 변화되어 TCP(50)사이부가 밝게 나타나는 심각한 화질저하 현상을 가져올 수 있다(도 6 참조).

발명이 이루고자 하는 기술적 과제

따라서, 본 발명의 목적은 상술한 문제점 및 다른 문제점들을 해결하는 것이다.

본 발명의 다른 목적은 균일한 표시특성 및 개선된 화질을 제공할 수 있는 액정표시장치의 TCP구조를 제공하는 것이다.

발명의 구성 및 작용

상술한 목적을 달성하기 위하여, 본 발명의 바람직한 실시예에 따른 액정표시장치는 액정패널과; 상기 액정패널 배면에 장착된 배광장치와; 상기 배광장치의 배면에 장착되어 상기 액정패널에 신호를 인가하는 인쇄회로기판과; 상기 액정패널과 상기 인쇄회로기판을 연결하고, 상기 배광장치의 상부모서리에 제 1 밴딩슬릿과; 상기 배광장치의 하부모서리에 제 2 밴딩슬릿과; 상기 제 1 밴딩슬릿과 상기 액정패널 사이에 적어도 하나의 슬릿을 가진 캐리어테이프를 포함하고 있다. 또한 상기 캐리어테이프는 상기 제 2 밴딩슬릿과 상기 인쇄회로기판의 사이에 적어도 하나의 슬릿을 더욱 포함하고 있다.

따라서, 액정패널과 제 1 밴딩슬릿 사이 및/또는 PCB(52)와 제 2 밴딩슬릿 사이에 위치한 슬릿으로 인하여, 상기 두 부분에서 발생하는 수축응력을 저감시켜 그 부분의 셀갭의 변화가 최소화되고, 휘도차가 감소함으로써, 급격적으로 균일한 화상이 얻어지며, 탭본딩(tap bonding)의 불량을 방지하여 액정표시장치의 품질을 향상시킬 수 있다.

이하, 첨부된 도면을 참조하여 본 발명의 실시예를 상세히 설명하도록 한다. 종래와 같은 구성요소는 동일한 부호를 사용하기로 한다.

도 7은 본 발명에 따른 TCP(50)의 구조를 나타낸 도면이다.

TCP(50)는, 종래의 TCP구조와 같이, 우선 솔더레지스트(solder resist)가 하부에 위치한다고 할 때, 솔더레지스트 상에는 다수의 리드라인이 배설되어 있고, 리드라인 상에는 점착제를 통하여 베이스필름(base film)이 배설되어 있다. 또한, TCP(50)는 제 1 밴딩슬릿(70)과 제 2 밴딩슬릿(72)이 각각 배설되어 있고, 제 1 및 제 2 밴딩슬릿(70)(72) 사이에는 구동회로(51)가 배설되어 있다. 이때 슬릿부분에 대응하는 리드라인상에는 폴리이미드가 코팅처리되어 있다.

WIPS PIVIEW 3.3.3.1

또한, 도 7 및 도 8에 도시한 바와 같이, TCP(50)는 단순히 배광장치(30)를 감싸고 액정패널(20)의 하부에 위치한 PCB(52)와 연결되는 데 필요한 가연성(flexibility)을 제공하기 위한 상술한 벤딩슬릿과 본 발명의 실시예에 따른 슬릿(74)으로 나누어 진다. 본 발명의 실시예에 따른 슬릿(74)은 바람직하게는 하부기판에 부착되는 TCP(50)의 패드부와 제 1 벤딩슬릿(bending slit; 70) 사이에 적어도 하나 이상이 위치하게 되는 데, 이는 상기 "B" 부분의 가연성을 증가시켜 TCP(50)가 액정패널의 셀갭에 미치는 영향을 최소화 하고자 함이다. 또한, 본 발명에 따른 슬릿(74)은 PCB(52)와 제 2 벤딩슬릿(72) 사이에도 적어도 하나 이상이 위치할 수 있는데, 이는 TCP(50)를 PCB(52)에 접착시킬 때, PCB(52)가 고온에서 상온으로의 온도 변화하여 TCP(50)에 상술한 바와 같은 수축응력이 발생하는 것을 방지하여 탭본딩(tap bonding)의 불량률 방지하기 위함이다.

TCP(50)는, 종래의 TCP가 부착되는 방식과 같이, 우선, 미도시의 이방성도전필름인 ACF(anisotropic conductive film)를 우선 TCP(50)가 부착되는 위치에 배설한 후, TCP(50)를 ACF와 압인한 후, 약간의 힘으로 가압착한다. 그 후, 고온상태에서 본 압착을 실행함으로써, TCP(50)와 액정패널 및 PCB(52)와의 접착이 완료된다.

발명의 효과

따라서, 본 발명의 바람직한 실시예에 따른 TCP를 사용하면, 액정패널과 제 1 벤딩슬릿 사이 및/또는 PCB와 제 2 벤딩슬릿 사이에 위치한 적어도 하나 이상의 슬릿으로 인하여, 상기 두 부분에서 발생하는 수축응력을 저감시켜 그 부분의 셀갭의 변화가 최소화되고, 휘도차가 감소함으로써, 궁극적으로 균일한 화상이 얻어지며, 테이프본딩의 불량률 방지하여 액정표시장치의 품질을 향상시킬 수 있다.

(57) 청구의 범위

청구항 1.

액정패널과;

상기 액정패널 배면에 장착된 배광장치와;

상기 배광장치의 배면에 장착되어 상기 액정패널에 신호를 인가하는 인쇄회로기판과;

상기 액정패널과 상기 인쇄회로기판을 연결하고, 상기 배광장치의 상부모서리에 제 1 벤딩슬릿과; 상기 배광장치의 하부모서리에 제 2 벤딩슬릿과; 상기 제 1 벤딩슬릿과 상기 액정패널 사이에 적어도 하나의 슬릿을 가진 캐리어테이프

를 포함하는 액정표시장치.

청구항 2.

제 1 항에 있어서,

상기 캐리어테이프는 상기 제 2 벤딩슬릿과 상기 인쇄회로기판의 사이에 적어도 하나의 슬릿을 더욱 포함하는 액정표시장치.

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청구항 3.

제 1 항에 있어서,

상기 캐리어테이프의 제 1 및 제 2 벤딩슬롯 사이에는 구동회로가 위치하는 액정표시장치.

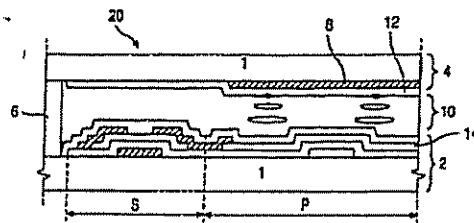
청구항 4.

제 1 항에 있어서,

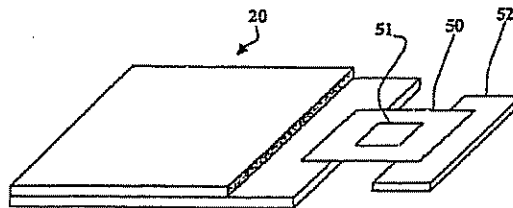
상기 캐리어테이프의 각 슬롯에는 폴리아미드가 도포된 액정표시장치

도면

도면 1

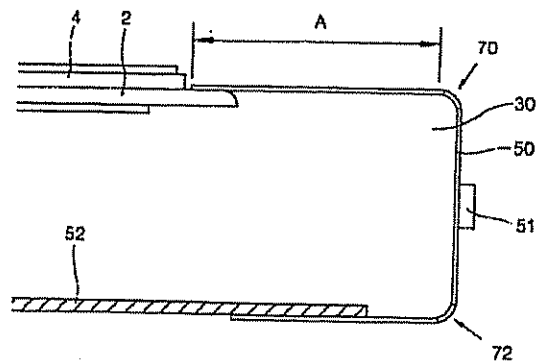


도면 2

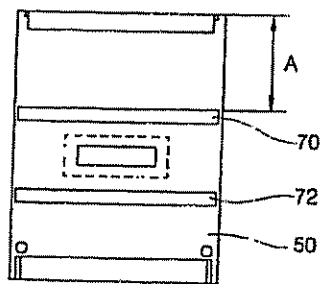


WIPS PIVew 3.3.3.1

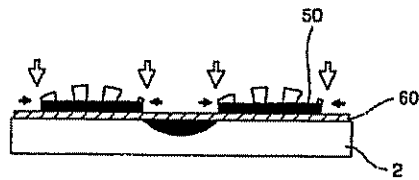
도면 3



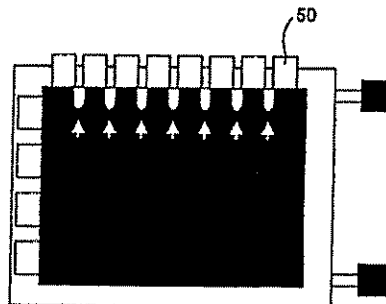
도면 4



도면 5

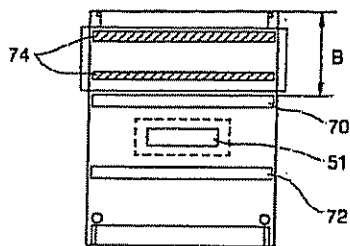


도면 6

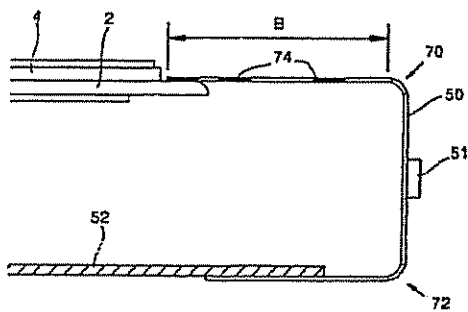


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도면 7



도면 8



[Illegible text block]

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LIQUID CRYSTAL DEVICE WITH CARRIER TAPE

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Request for Examination:	None

Abstract

This invention discloses a liquid crystal device including a liquid crystal panel; a backlighting device mounted on the back of said liquid crystal panel; a printed circuit board that is mounted on the back of said backlighting device to apply a signal to said liquid crystal panel; a first bending slit that connects said liquid crystal panel with said printed circuit board and is located at the top corner of said backlighting device; a second bending slit that is located at the bottom corner of said backlighting device; and a carrier tape that has at least one slit between said first bending slit and said liquid crystal panel. In addition, said carrier tape has at least one slit between said second bending slit and said external circuit.

Therefore, as a result of the slit located between a liquid crystal panel and a first bending slit and/or between a PCB and a second bending slit, shrinkage stress taking place at said two

parts is reduced so as to minimize changes in the cell gap at the part and decrease the brightness difference, which can ultimately result in uniform images, prevent defects in tape bonding and improve the quality of a liquid crystal device.

Representative Drawing

Figure 8

Specification

Brief Description of the Drawings

Figure 1 is a cross-sectional view illustrating a liquid crystal panel of an existing liquid crystal device.

Figure 2 is an oblique view illustrating the structure in which a TCP with a built-in liquid crystal panel and integrated drive circuit is connected in the TAB mode.

Figure 3 is a cross-sectional view of Figure 2.

Figure 4 is a drawing showing an existing TCP.

Figure 5 is a drawing showing the method in which a TCP is attached to a liquid crystal panel.

Figure 6 is a drawing showing the problem of an existing liquid crystal device.

Figure 7 is a drawing showing the TCP according to an example of this invention.

Figure 8 is a drawing showing the structure in which a TCP is connected to a liquid crystal panel and PCB according to an example of this invention.

Description of Key Parts of the Drawings

20: Liquid crystal panel	50: TCP
51: Integrated drive circuit	52: PCB
70: First bending slit	72: Second bending slit
74: Slit	

Detailed Description of the Invention

Objective of the Invention

Technology to Which the Invention Belongs and Available Art of the Field

This invention deals with a liquid crystal device and more specifically with the liquid crystal device in which the TAB (tape automated bonding) mode is used to mount a drive IC (integrated drive circuit).

The drive principle of a liquid crystal device utilizes the optical anisotropic and polarization properties of liquid crystal. Because said liquid crystal is thin and long in terms of

its structure, arrangement of its molecules is oriented, and orientation of the molecular arrangement may be controlled artificially by applying an electric field to the liquid crystal.

Therefore, if the molecular arrangement orientation of said liquid crystal is optionally controlled, the molecular arrangement of the liquid crystal is changed, and light is diffracted in the direction of the molecular arrangement orientation of said liquid crystal by optical anisotropy so the image information may be expressed.

Currently, an active matrix LCD (AM-LCD) as described above in which thin film transistors and pixel electrodes connected to said thin film transistors are arranged in a matrix mode has received the most attention for its excellent resolution and video implementation capabilities.

In general, the structure of a liquid crystal panel which is a basic part comprising a liquid crystal device is described below.

Figure 1 is a cross-sectional view illustrating the cross section of a common liquid crystal panel.

In a liquid crystal panel (20), two substrate sheets (2, 4) are formed corresponding to each other in which many types of devices have been formed, and a liquid crystal layer (10) is located between said two substrate sheets (2, 4) in an interposed form.

Said liquid crystal panel (20) is comprised of a top substrate (4), in which a color filter expressing colors is formed, and a bottom substrate (2), in which a switching circuit is embedded that can convert the molecular arrangement orientation of said liquid crystal layer (10).

In said top substrate (4) are formed a color filter layer (8) that implements colors and a common electrode (12) that covers said color filter layer (8). Said common electrode (12) plays the role of one electrode that applies voltage to the liquid crystal (10). Said bottom substrate (2) is comprised of a thin film transistor (S) that plays the role of switching and a pixel electrode (14) that receives a signal applied from said thin film transistor (S) and applies voltage to said liquid crystal (10) and plays the role of the counter-electrode.

The part in which said pixel electrode (14) has been formed is called a pixel part (P).

To prevent the liquid crystal (10) injected between said top substrate (4) and bottom substrate (2) from leaking, the edges of said top substrate (4) and bottom substrate (2) are sealed with a sealant (6).

Said thin film transistor (S) receives a signal applied from an external integrated circuit (IC) to drive said pixel electrode (14).

Said thin film transistor (S) is comprised of a gate electrode, a source electrode, and a drain electrode, and said gate electrode is in contact with gate wiring. In addition, said source electrode is in contact with data wiring, a gate pad and a data pad are formed at the end of said gate and data wiring respectively, and said gate and data pads are connected to the external IC.

Said external IC can be largely divided into two types including a gate drive circuit that is connected to said gate pad to control said gate electrode and a data drive circuit that is connected to said data pad to control said source electrode.

The techniques to connect a drive IC to an LCD panel in order to drive an LCD as described above include COB (chip on board), TAB (tape automated bonding) and COG (chip on glass).

In case of the liquid crystal device of the existing segment mode or a panel with low resolution, the drive IC was on a PCB (printed circuit board) because the number of lead lines was small, and it was easy to connect the lead of a board with a panel by an HSC (heat seal connector).

However, as the resolution of LCD panels has increased, it has not been easy to mount a drive IC with a tremendous number of leads on a board. That is, in case of the LCD panel with resolution of 600 x 800 for example, it takes 600 x 800 x 3 pixels to express natural colors, and each pixel must be connected to a drive IC.

In addition, the wire bonding mode is a so-called sequential connection in which connection terminals are connected one by one. If the number of connections for connection terminals is very high, as in an X-ray detector, it takes much time, and connection is impossible when the distance between connection terminals is narrow. In addition, there is also the problem of increasing a connection area that results from the height of a wire loop.

The mode for resolving the problem above is the TAB (tape automated bonding) mode. That is, said TAB mode has resolved the problem above by mounting a drive IC on a tape carrier. When said tape carrier is used for a drive IC, it is called a tape carrier package (TCP).

Figure 2 is a drawing illustrating the structure in which the TCP (50) with built-in and drive IC (51) is connected by the TAB mode to LCD panel (20).

That is, a drive IC (51) is built into said TCP (50), and said LCD panel (20) is connected to said drive IC (51) by way of said TCP (50). And, a printed circuit board (52) (herein 'PCB') is also connected to said TCP (50).

Common assembly processes for said TCP mode may be largely divided into an inner lead bonding (ILB) process, an encapsulation process, and an outer lead bonding (OLB) process wherein the ILB process arranges a carrier tape fed in a reel-to-reel mode and a chip on board in terms of their locations and makes connection by thermal energy and pressure. The encapsulation process is a process that plays the role of protecting the chip and inner lead from the surrounding environment by coating an epoxy resin on the chip following the inner lead bonding, and the outer lead bonding is a process that connects the outer leads to a pad on a PCB (printed circuit board) after electrical testing is completed following the encapsulation process.

Because the pitch of the pad electrodes becomes narrower with higher resolution that results in higher precision, connection process conditions become more difficult. In addition, the IC mounting mode based on such a technique has recently seen drastic increase in application as the demand for more pins, miniaturization, and lighter weight has increased, and, since the connection process has been simplified such that IC chips are subject to bonding as a whole, it has become easy to repair and reduce connection defects.

The mounting method for an LCD panel in the TAB mode described above has been widely practiced as the most common mode.

On the other hand, a PCB (52) is located on another face of a backlighting device, not illustrated, and will be described in detail referring to the schematic cross-sectional drawing of Figure 3.

As illustrated in Figure 3, a backlighting device (30) with a light source, not illustrated, is located at the bottom of a panel (20), and a PCB (52) is located on the other face of the backlighting device (30). While a pad part (21) of an LCD panel (20) and a PCB (52) are connected to PCB by TCP (50), a drive IC (51) is mounted on the TCP (50).

When a solder resist is located at the bottom, the TCP (50) has the structure in which a number of lead lines are deployed on the solder resist and a base film is deployed on the lead line with an adhesive. In addition, as illustrated in Figure 4, a first bending slit (70) and a second bending slit (72) are deployed in the TCP (50), which is simply intended to surround the backlighting device (30) and provide the flexibility required to connect with the PCB (52) located at the bottom of an LCD panel (20). In addition, polyimide is coated on the lead lines of this slit part.

The TCP (50) and bottom substrate described above are usually attached by the following method: as illustrated in Figure 5, an anisotropic conductive film (ACF, 60) is first deployed on the location where a TCP (50) is attached before the TCP (50) is aligned with the ACF (60) and pressed with a slight force. Afterward, this pressing is carried out at a high temperature to complete adhesion.

At this time, in case of a liquid crystal device with high brightness, the part "A" between the pad part of the TCP (50) attached to a bottom substrate and a first bending slit (70) has very low flexibility. So, as illustrated in Figure 5, the TCP (50) edge part returns to a normal temperature and incurs shrinkage stress upon adhesion. Therefore, the cell gap of the panel part corresponding to the part between two adjacent TCPs (50) undergoes local changes that bring about the phenomenon of serious picture quality deterioration and that turns the part between the TCPs (50) light (refer to Figure 6).

Technical Tasks of the Invention

Therefore, the objective of this invention is to solve the problem described above and other problems.

Another objective of this invention is to provide the TCP structure of a liquid crystal device that can provide uniform display characteristics and improve picture quality.

Configuration and Action of the Invention

To achieve the objectives described and above, the liquid crystal device according to the preferred example of this invention includes a liquid crystal panel; a backlighting device mounted on the back of said liquid crystal panel; a printed circuit board that is mounted on the back of said backlighting device to apply a signal to said liquid crystal panel; a first bending slit that connects said liquid crystal panel with said printed circuit board and is located at the top corner of said backlighting device; a second bending slit that is located at the bottom corner of said backlighting device; and a carrier tape that has at least one slit between said first bending slit and said liquid crystal panel. In addition, said carrier tape further includes at least one slit between said second bending slit and said printed circuit board.

Therefore, as a result of the slit located between a liquid crystal panel and a first bending slit and/or between a PCB (52) and a second bending slit, shrinkage stress taking place at said two parts is reduced so as to minimize changes in the cell gap at the part and decrease the brightness difference; ultimately, the result is uniform images, the prevention of defects in tap bonding and an improvement of the quality of a liquid crystal device.

An example of this invention is described in detail below, referring to the drawings attached. Existing components use identical symbols.

Figure 7 is a drawing showing the structure of the TCP (50) according to the invention.

Like the existing TCP structure, assuming a solder resist is located at the bottom, the TCP (50) has the structure in which a number of lead lines are deployed on the solder resist and a base film is deployed on the lead line with an adhesive. In addition, a first bending slit (70) and a second bending slit (72) are deployed on the TCP (50), and a drive IC (51) is deployed between the first (70) and second bending slit (72). Here polyimide is coated on the lead lines corresponding to the slit part.

In addition, as illustrated in Figure 7 and Figure 8, the TCP (50) is divided into the bending slit described above that is intended to merely surround the backlighting device (30) and provide the flexibility required to connect to a PCB (52) located at the bottom of a liquid crystal panel (20) and the slit (74) according to the example of this invention. While at least one slit (74) according to the example of this invention is preferably located between the pad part of the TCP (50) attached to a bottom substrate and a first bending slit (70), it is intended to increase the

flexibility of said part "B" and minimize effects of the TCP (50) on the cell gap of the liquid crystal panel. In addition, at least one slit (14) according to the invention may be located between a PCB (52) and a second bending slit (72), which is intended to prevent the PCB (52) from undergoing changes from a high temperature to a normal temperature and prevent the TCP (50) from incurring the shrinkage stress described above, so that tap bonding defects may be prevented.

Like the mode of attaching an existing TCP, after an ACF (anisotropic conductive film) is deployed first at the location of the TCP (50) attachment, the TCP (50) is aligned with the ACF before the TCP (50) liquid crystal panel and PCB (52) is completed by carrying out such pressing at a high temperature.

Effects of the Invention

Therefore, if the TCP according to the preferred example of this invention is used, as a result of at least one slit located between a liquid crystal panel and a first bending slit and/or between a PCB and a second bending slit, shrinkage stress taking place at said two parts is reduced so as to minimize changes in cell gap at the part and decrease the brightness difference, which can ultimately result in uniform images, prevent defects in tape bonding, and improve the quality of a liquid crystal device.

Claims

1. A liquid crystal device including a liquid crystal panel; a backlighting device mounted on the back of said liquid crystal panel; a printed circuit board that is mounted on the back of said backlighting device to apply a signal to said liquid crystal panel; a first bending slit that connects said liquid crystal panel to said printed circuit board and is located at the top corner of said backlighting device; a second bending slit that is located at the bottom corner of said backlighting device; and a carrier tape that has at least one slit between said bending slit and said liquid crystal panel.

2. The liquid crystal device of Claim 1 wherein said carrier tape further includes at least one slit between said second bending slit and said printed circuit board.

3. The liquid crystal device of Claim 1 wherein a drive integrated circuit is located between the first and second bending slit of said carrier tape.

4. The liquid crystal device of Claim 1 wherein polyimide is coated on each slit of said carrier tape.

Drawings

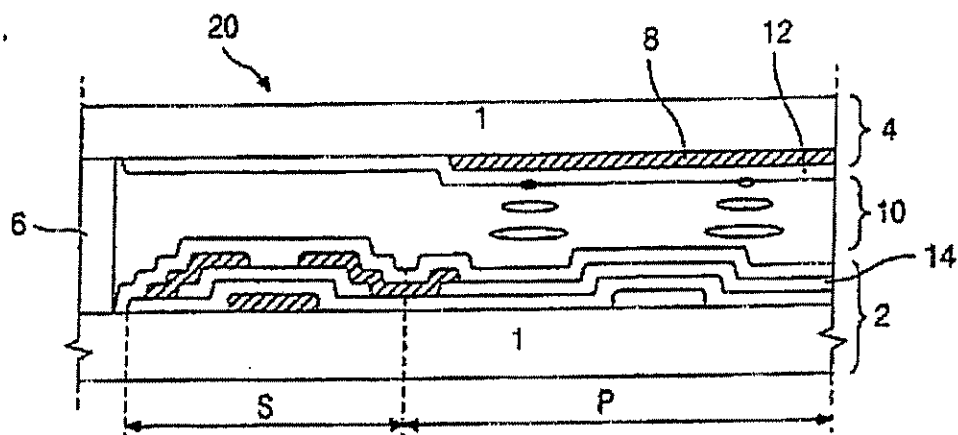


Figure 1

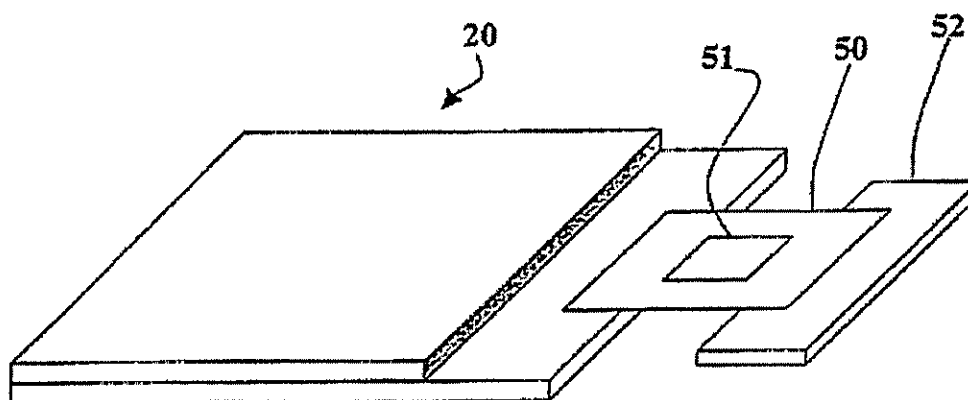


Figure 2

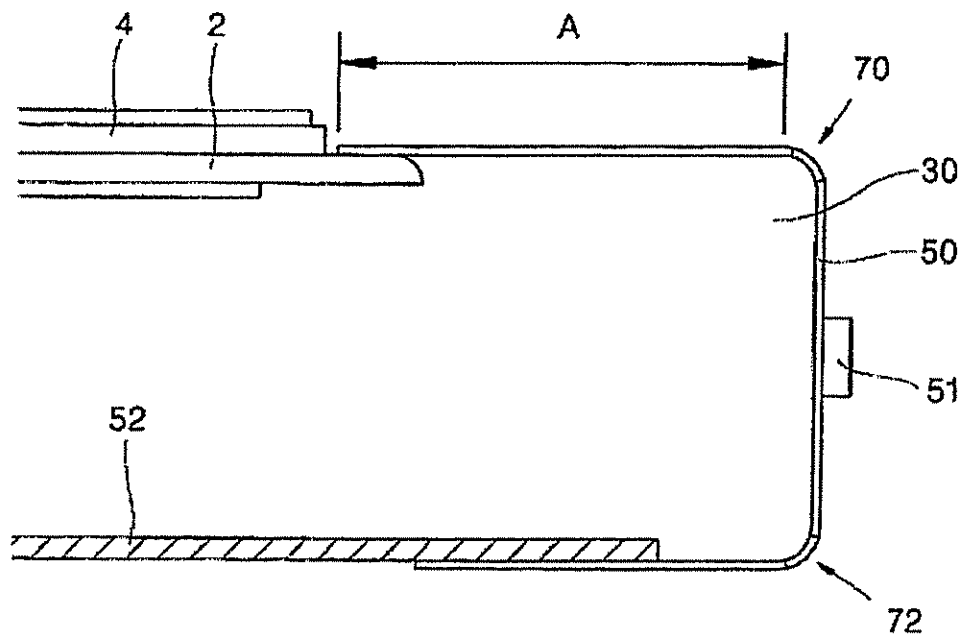


Figure 3

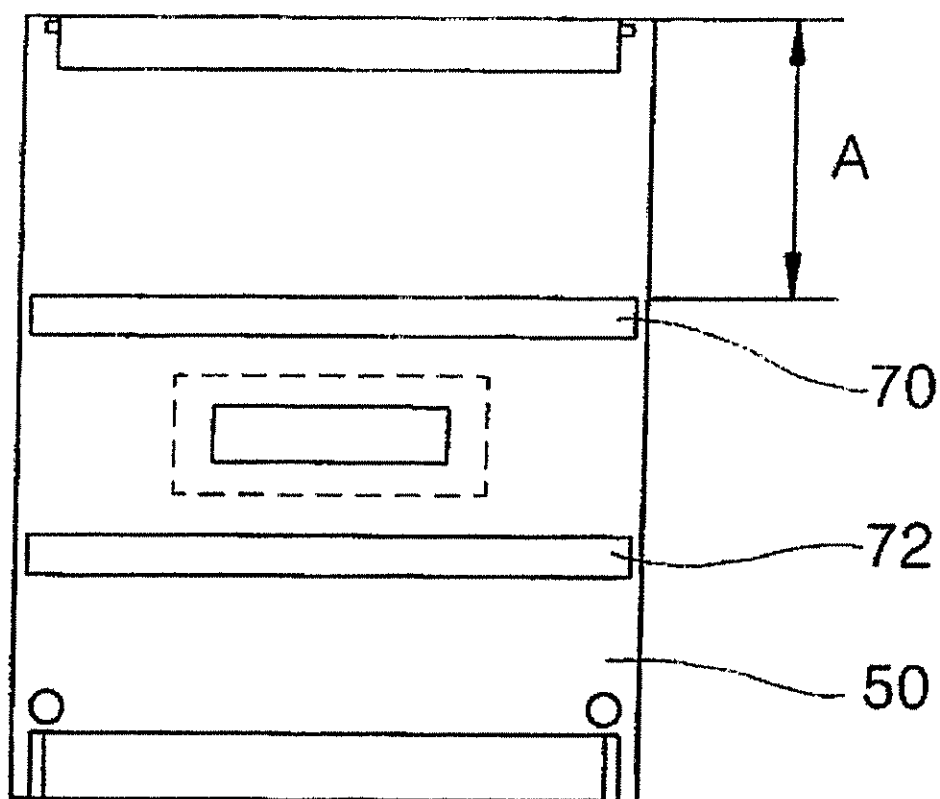


Figure 4

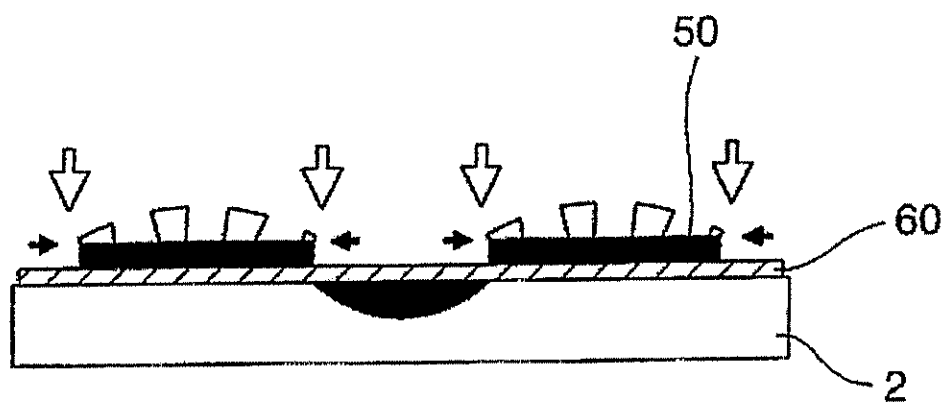


Figure 5

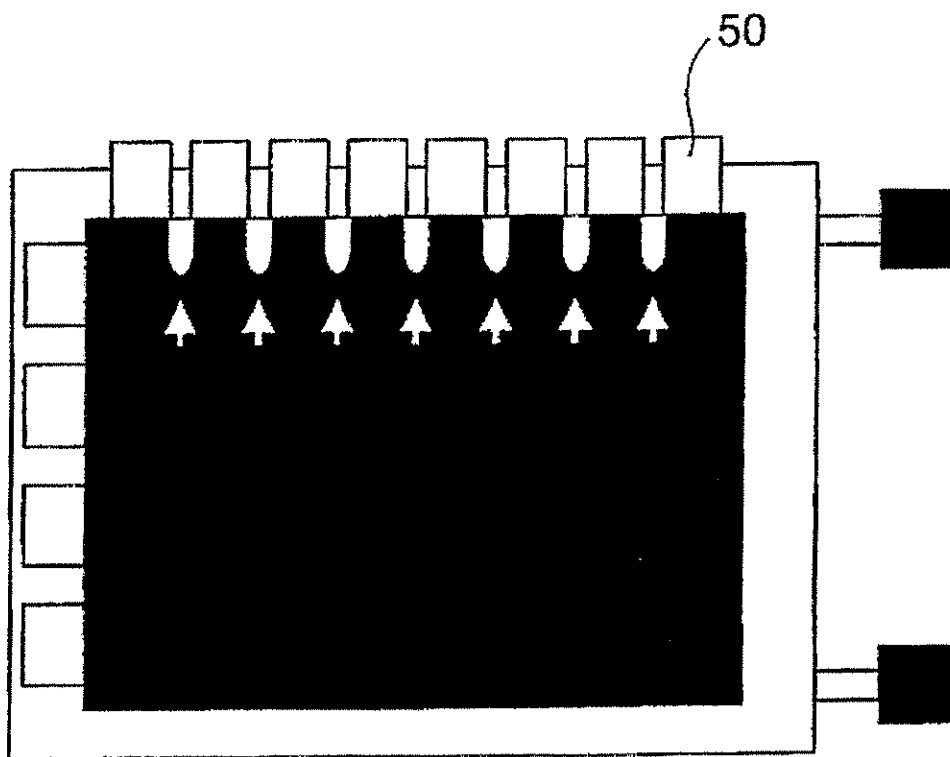


Figure 6

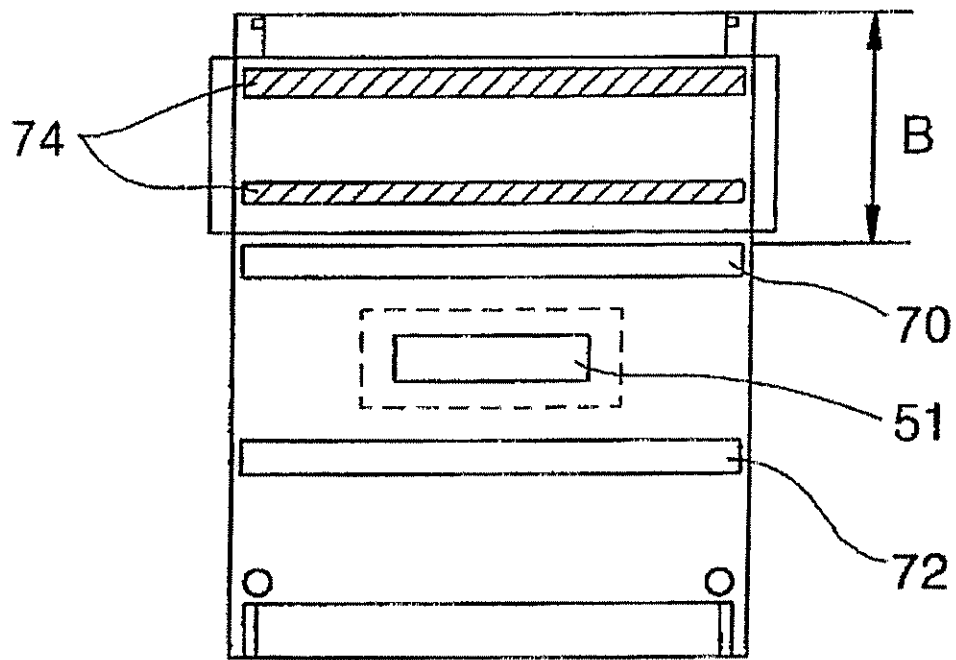


Figure 7

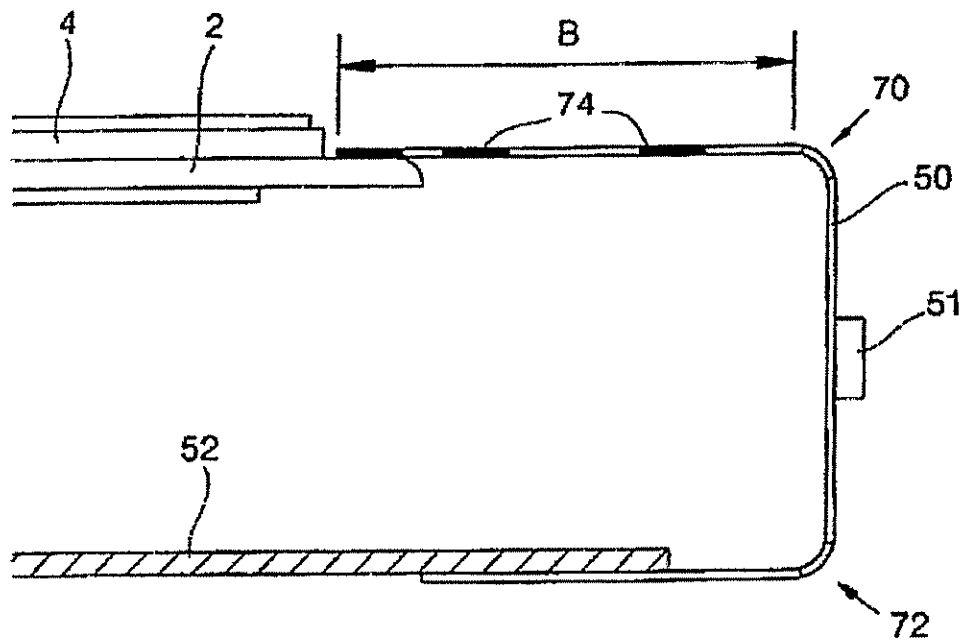


Figure 8



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COMPANY

October 4, 2006

Re: 6719-106892

To Whom It May Concern:

This is to certify that a professional translator on our staff who is skilled in the Korean language translated "KR2001-0065166A" from Korean to English.

We certify that this English translation conforms essentially to the original Korean language.

Kim Vitray
Operations Manager

Subscribed and sworn to before me this 4th day of October, 2006.



Tina Wuelfing
Notary Public

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EXHIBIT 3

REDACTED